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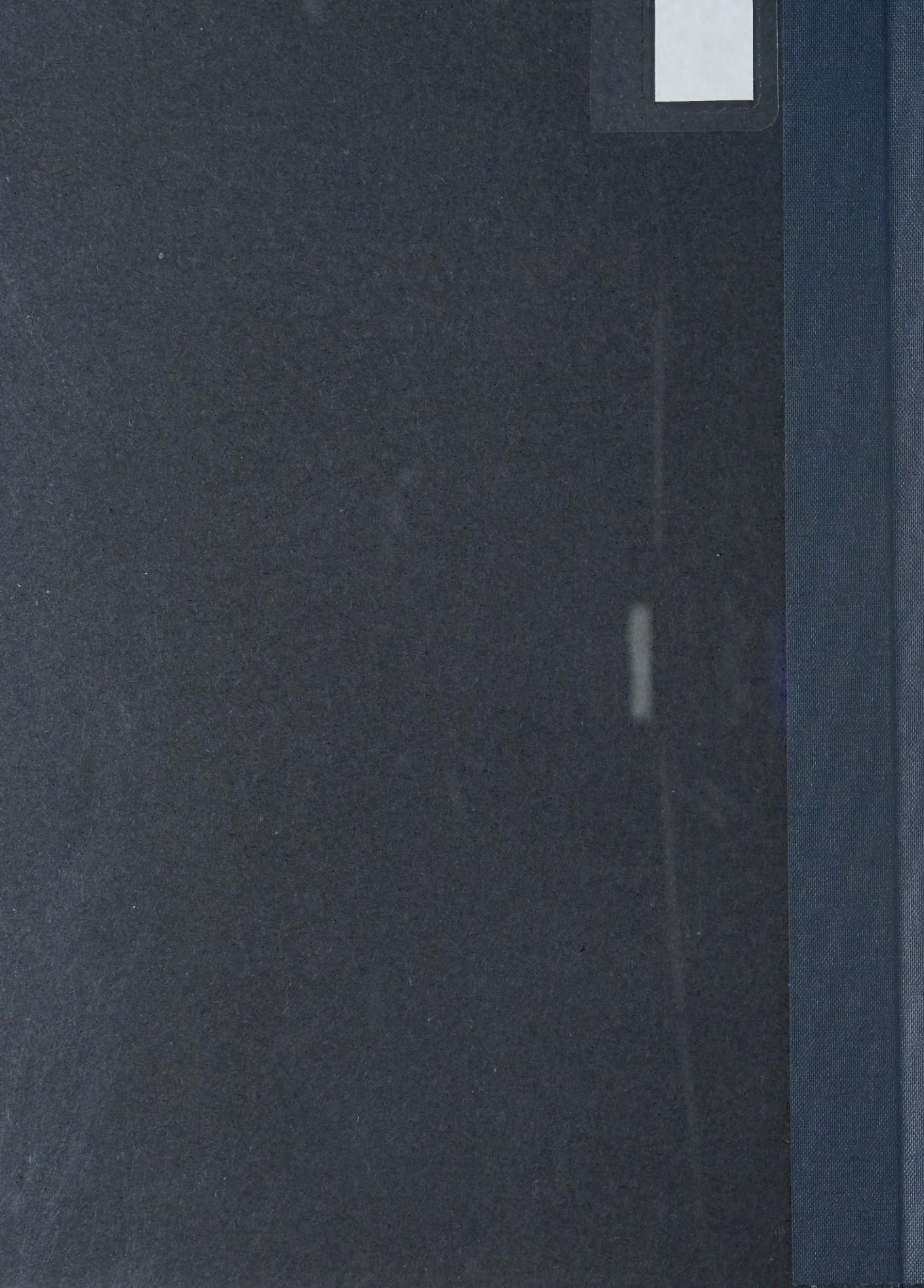
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AGRICULTURAL RESEARCH

"Agricultural research doesn't cost, it pays," says Dr. E. J. LeRoux, assistant deputy minister in charge of Agriculture Canada's Research Branch. Whatever statistics are chosen to demonstrate the benefits of research into crops, genetic improvement of livestock or farm management systems, the result is a return on investment that puts the agriculture industry in the developed countries far ahead of any other sector of the economy in terms of productivity gains.

There can be no doubt that agricultural research is one of the most essential and effective tools to increase food production in the Third World and solve the problems of hunger and nutrition on a global basis. Everyone is familiar with the "Green Revolution" and the dramatic food production increases it created in India and the Philippines with the new high-yielding wheats and rices. It is estimated that these modern varieties annually yield about 50 million tonnes more than would have been produced using old varieties -- enough food grain for 500 million people. Norman Borlaug, an American, was awarded the Nobel Prize as the father of the Green Revolution, but he was supported by an international team of scientists -- including a number of Canadians -- working in several international agricultural research centres supported, at that time, by the Ford and Rockefeller Foundations.

It must be recognized, however, that many countries have not yet developed their agricultural resources to achieve their full potential. Hunger and malnutrition still persist and the fruits of the Green Revolution have yet to be savored in many parts of the world. What has been achieved with wheat and rice -- and in the developed countries with corn, rapeseed and soybeans -- has so far yet to be achieved by scientists working on millet, sorghum, cassava, potatoes and other crops that are staple foods in large areas of Asia, Africa and Latin America.

Coordination of Effort

A key to the solution lies in the efforts of a network of agricultural research centres around the world. In 1971 the Consultative Group on International Agricultural Research (CGIAR) was formed around the four research centres that were in existence at the time. Today the CGIAR supports 13 centres in areas as widely separated as Colombia and the Philippines, Kenya and Mexico. (A list of the 13 research centres, with their areas of specialty, is included. See Annex A.)

The CGIAR is basically a consortium which includes 36 donor countries and agencies, plus representatives of the developing regions. It meets regularly to discuss various aspects of agricultural research and the overall policy of the group. Co-sponsors are the World Bank, the United Nations Development Program (UNDP) and the Food and Agriculture Organization (FAO). The World Bank contributes about 12 per cent of the total core budget for all the centres (U.S.\$180 million in 1984) and acts as donor of last resort; the donor countries and other institutions provide the balance. No strings are attached to the core funding, but donor countries choose the institutions to which they will contribute.

The Canadian International Development Agency (CIDA) was a founding member of the CGIAR and represents Canada within the organization. The Canadian contribution for 1986 will be \$14.8 million. Canada contributes to all 13 centres ranging from \$375,000 to ISNAR (the International Service for National Agricultural Research) in The Netherlands, to \$1.85 million to IITA (the International Institute of Tropical Agriculture) in Nigeria, and the same amount to ICRISAT (the International Crops Research Institute for the Semi-Arid Tropics) in India. CIDA's bilateral programs also support specific activities at some of the centres.

IDRC (the International Development Research Centre) in Ottawa, a Canadian public corporation which supports research designed to adapt science and technology to the needs of the developing countries, was also a founding member of the CGIAR. IDRC contributes to its activities and has taken a leading role in the establishment of several of the international research centres. In 1986 CIDA, IDRC and Agriculture Canada hosted the semi-annual meeting of the CGIAR in Ottawa.

Better Crops

Research carried out by the centres, and the national agricultural research systems with which they cooperate, has over the past 15 years resulted in better varieties of rice, maize, wheat, potatoes and other crops. Improved resistance to insects and pests has been bred into many plants. Genetic research in livestock has resulted in healthier and more productive animals. Studies of soil properties, agrometeorology and cultural and management practices have enabled farmers to make better use of their basic natural resources.

One project in which Canada played a key role was the development of triticale, a new cereal grain developed from crossing wheat and rye and maintaining the best characteristics of both. Its protein quality and yield are close to those of wheat, but it has more cold tolerance. It can be grown on poorer soils than wheat and has drought tolerance similar to rye.

The universities of Manitoba and Guelph and the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico began collaborating on research into the new grain some years ago. It was ready for release in the mid-1970s and is now being grown extensively in Kenya, where 25 per cent triticale is used in bread-making to extend the wheat flour available. Triticale is also grown extensively now in Eastern Europe. Further research is under way at the International Centre for Agricultural Research in Dry Areas (ICARDA) in Syria because of triticale's high productivity in adverse conditions.

There is another plus, particularly for farmers in the Third World. Triticale, like barley, can be grazed by livestock after germination when it is just a few centimetres tall and will grow again to produce a grain and straw crop. This is of tremendous importance to sheep and goat herders of the Middle Ease and North Africa.

Genetic Improvement

Genetic improvement of crops is another major facet of research funded through the CGIAR. The wild species or near relatives of cultivated crops, and their unimproved cultivated cousins (landraces and primitive cultivars), are collected from around the world and conserved in a network of 35 gene banks in 24 different countries supported by the International Board for Plant Genetic Resources (IBPGR) with headquarters in Rome. Agriculture Canada has been designated as the international gene bank for the world base collection of oats and barleys and the duplicate collections for the millets and oil seed brassicas. The gene banks are a source of many valuable characteristics used by plant breeders to expand the genetic base of improved varieties or to develop totally new ones. Breeding programs at the research centres aim to improve yields and yield stability, to increase disease and pest resistance and to improve the capacity for growth under adverse or diverse conditions.

Battle Against the Mealybug

Canadians know little of cassava except as tapioca, but for millions around the world (200 million in Africa alone) it is the staple food. They use cassava and cassava products as we use bread and potatoes as the major source of carbohydrates. Cassava leaves, used as a green vegetable, are an important source of protein. Cassava production, however, is threatened by the cassava mealybug, an insect that can cause up to 60 per cent reduction in the root crop and total loss of the leaves. It was first discovered in Zaire in 1973 and has now spread to almost all African cassava-growing areas. It is considered to be Africa's worst agricultural pest. Several of the international research centres are now cooperating in a world-wide battle against the mealybug.

No one knew where the mealybug originated, although it was assumed to have come from South America. It appeared to have no natural enemies. Then scientists from the International Centre for Tropical Agriculture (CIAT) in Colombia discovered some predator species in Paraguay. Later, other types were also collected in Brazil and Bolivia, where the mealybug caused no major damage to cassava.

The International Institute of Tropical Agriculture (IITA) in Nigeria and the Commonwealth Institute of Biological Control (CIBC) sent a joint expedition to South America in a search for natural enemies of the mealybug. They found four and, after appropriate quarantine procedures, they were brought to Nigeria and are being introduced in Africa on a wide scale. The IITA advocates such a biological control as the most feasible method of attack because cassava is grown on widely separated small holdings which often have difficult access, and because of its environmental safety, rapid control potential and implementation without the direct involvement of the farmer.

Varied Efforts

Research projects funded through the CGIAR are many and diverse. Besides such crops as wheat, maize, potatoes and rice, they involve sorghum, millet, pigeonpeas, chickpeas, yams and cocoyams -- foods that are not well known in Canada, but which constitute a major part of the diet of millions in tropical and subtropical parts of the world. Research into the control of such diseases as East Coast Fever and Sleeping Sickness in livestock, improving poor rangeland in South America and Africa, and designing new tools and more efficient methods of farming are also part of the work of the different agricultural research centres.

The international research centres are implementing or are involved in a number of CIDA's agricultural projects, including the wheat program and rice research in Bangladesh, a rice research institute in Burma, a grains development project in Ghana, a bean program and a regional maize project in East Africa, corn production in Haiti and a study of donor food aid policies. In the future, it is possible that the centres may be involved with other CIDA projects in China, Thailand, Francophone West Africa, the Southern African Development Coordination Conference (SADCC), Zimbabwe and the Caribbean.

In addition, important facts about the social and economic constraints to increased agricultural practices have been brought to light, which have led to the creation of the International Food Policy Research Institute (IFPRI) in Washington, D.C. In turn, ISNAR is charged with assisting developing countries in their efforts to establish or improve their national agricultural research systems.

The CGIAR, which now receives funding from some developing countries as well as from the developed countries, is one way the concerted attack against malnutrition and hunger can be mounted. Research provides technological and agricultural management improvements which are important building blocks for improved agricultural productivity.

Other Activities

CIDA also provides support for national agricultural research activities, outside of the CGIAR framework, in several developing countries, as agricultural research elements in bilateral agricultural development projects. Assistance is generally given in the form of technical assistance, training, or the provision of research equipment. Usually, research is a critical item in such projects, with others being, for example, farmer credit, infrastructure, or providing improved plant or animal genetic material. Multi-faceted bilateral projects of this type are presently in operation, or under preparation, in China, Bangladesh, India and Sudan.

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ILRAD International Laboratory for Research on Animal Diseases
Nairobi, Kenya
trypanosomiasis, theileriosis
1984 budget: \$8.5 million; professional staff: 30

ILCA International Livestock Centre for Africa
Addis Ababa, Ethiopia
livestock production systems in Africa
1984 budget: \$11.8 million; professional staff: 59

IRRI International Rice Research Institute
Manila, Philippines
rice
1984 budget: \$20.2 million; professional staff: 99

ISNAR International Service for National Agricultural Research
The Hague, Netherlands
research development assistance
1984 budget: \$3.3 million; professional staff: 27

WARDA West Africa Rice Development Association
Monrovia, Liberia
rice
1984 budget: \$2.1 million; professional staff: 68

Data taken from: Summary of International Agricultural Research Centres:
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